

12045
Ilmenite Basalt
63 grams

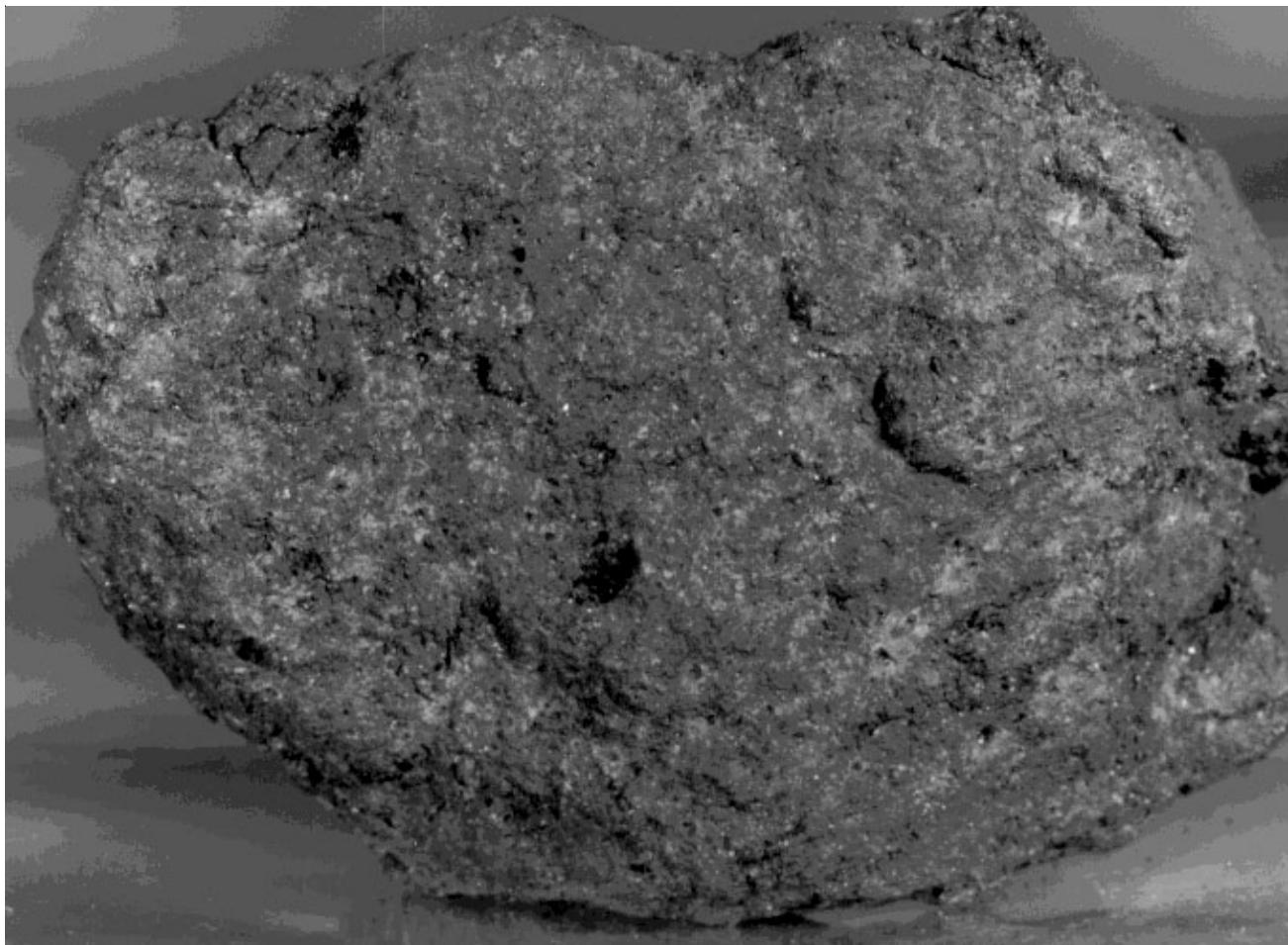


Figure 1: Photo of 12045 showing rounded surface with many zap pits due to micrometeorite bombardment. NASA #S70-19002. Sample is 4.5 cm across.

Introduction

12045 is a small flat rock with lots of micrometeorite craters.

ilmenite is highly skeletal and occurs as parallel sets of thin platelets. Thus 12045 appears to be a more crystalline, less glassy version of 12008.

Petrography

Dungan and Brown (1977) compare 12045 with olivine vitrophyre 12008. Like 12008, 12045 has glomerophyric aggregates of early-formed olivine phenocrysts, spinel grains and rare metal droplets. It also has elongate non-skeletal phenocrysts of titanomagnetite. These phenocryst assemblages are set in a variolitic groundmass of acicular pyroxene, plagioclase, silica, ilmenite, troilite and metal. The

Mineralogical Mode for 12045

	Neal et al. 1994
Olivine	8.8
Pyroxene	57
Plagioclase	20.6
Ilmenite	
Chromite +Usp	
mesostasis	5.7
“silica”	0.6



Figure 2: Faded photomicrograph of thin section 12045,6 showing olivine pheocrysts in groundmass cut by fine, parallel needles of ilmenite. NASA S70-50032. Plane polarized light. Scale about 3 mm.

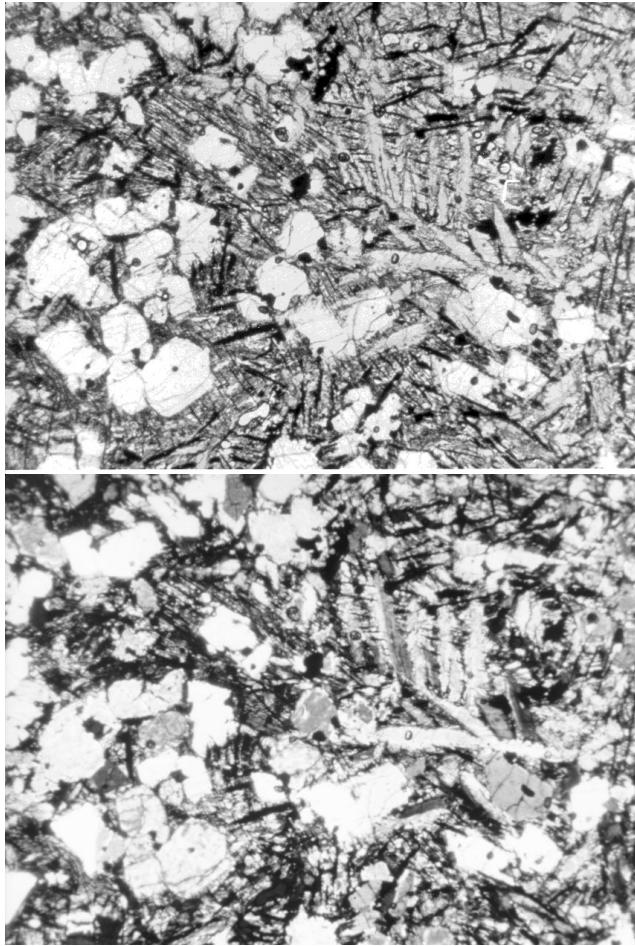


Figure 3: Photomicrograph of thin section 12045,7 (plane-polarized and cross-nicols). Note feathery pyroxene. NASA#S70-17968-969. 2.7 mm across.

Mineralogy

Olivine: Dungan and Brown (1977) report that Fo₇₄ is the most magnesian olivine in 12045.

Pyroxene: Dungan and Brown (1977) present pyroxene compositions in 12045 in figure 3.

Ilmenite: The groundmass of 12045 is riddled with fine ilmenite needles in odd parallel alignment (figure 2).

Chemistry

The chemical composition of 12045 has been determined by Rhodes et al. (1977), Nyquist et al. (1979) and Snyder et al. (1997).

Radiogenic age dating

Snyder et al. (1997) reported the isotopic composition of Sr and Nd.

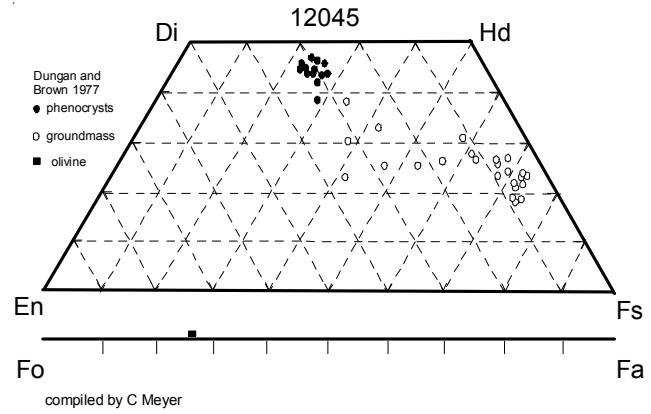


Figure 4: Pyroxene composition of 12045 (adapted from Dungan and Brown 1977).

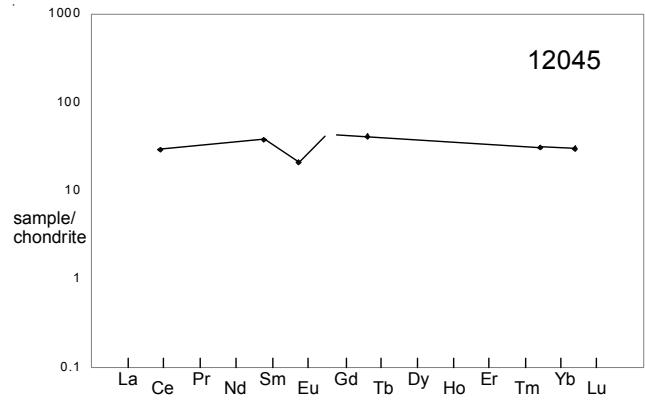


Figure 5: Normalized rare-earth-element diagram for 12045 (data from Nyquist et al. 1979).

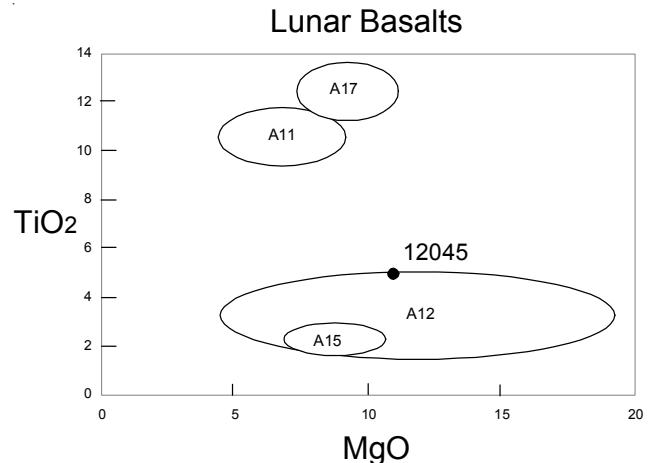


Figure 6: Composition of 12045 compared with other lunar basalts.

List of Photo #s for 12045

S70-17966 – 17971	TS
S70-19002 – 19026	B & W mug
S70-48255 – 48264	color
S70-50032 – 50035	TS

Table 1. Chemical composition of 12045.

reference weight	Rhodes77 50 mg	Nyquist79	Snyder97
SiO ₂ %	42.3 (c)	42.3	
TiO ₂	4.78 (c)	4.78	
Al ₂ O ₃	8.06 (c)	8.06	
FeO	22.09 (c)	22.09	
MnO	0.29 (c)	0.29	
MgO	11.63 (c)	11.63	
CaO	9.09 (c)	9.09	
Na ₂ O	0.26 (a)	0.26	
K ₂ O	0.07 (c) 0.062	(b) 0.07	
P ₂ O ₅	0.09 (c)	0.09	
S %	0.09 (c)		
<i>sum</i>			
Sc ppm	54 (a)		
V			
Cr	4060 (a)	3800	(d)
Co	52 (a)	55.9	(d)
Ni	40 (a)	56.1	(d)
Cu		16.4	(d)
Zn		9.98	(d)
Ga		3.83	(d)
Ge ppb			
As			
Se			
Rb		0.717 (b)	0.709 (d)
Sr	136 (c) 143	(b) 132.1	(d)
Y	50 (c)	49.7	(d)
Zr	112 (c)	109.9	(d)
Nb	5.3 (c)	5.17	(d)
Mo			
Ru			
Rh			
Pd ppb			
Ag ppb		398	(d)
Cd ppb			
In ppb			
Sn ppb			
Sb ppb			
Te ppb			
Cs ppm		0.038 (d)	
Ba	52 (b) 52.7	(b) 52.9	(d)
La		6.65	(d)
Ce	17.4 (a) 16.2	(b) 17.3	(d)
Pr		2.83	(d)
Nd		14.8 (b) 15.1	(d)
Sm	5.6 (a) 5.48	(b) 5.64	(d)
Eu	1.19 (a) 1.28	(b) 1.06	(d)
Gd		7.69 (b) 6.04	(d)
Tb	1.51 (a)	1.26	(d)
Dy		9.57 (b) 7.74	(d)
Ho		1.6	(d)
Er		5.66 (b) 4.41	(d)
Tm		0.63	(d)
Yb	5.1 (a) 4.94	(b) 4.25	(d)
Lu	0.73 (a) 0.721	(b) 0.58	(d)
Hf	4.5 (a)		
Ta		0.274	(d)
W ppb			
Re ppb			
Os ppb			
Ir ppb			
Pt ppb			
Au ppb			
Th ppm		0.679 (d)	
U ppm		0.176 (d)	

technique (a) INAA, (b) IDMS, (c) XRF, (d) ICP-MS